Dr Oliver Mathematics
GCSE Mathematics
2003 November Paper 6H: Calculator
2 hours

The total number of marks available is 100.
You must write down all the stages in your working.

1. Use your calculator to work out the value of (3)

$$\frac{(7.91 - \sqrt[3]{81}) \times 4.32}{6.23 + 1.491}.$$

   Give your answer correct to 3 significant figures.

2. A can of drink is in the shape of a cylinder. (3)
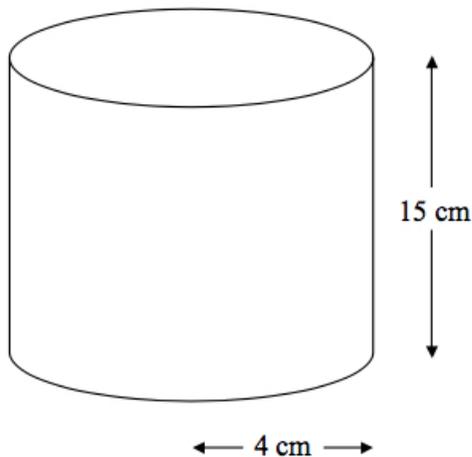   The can has a radius of 4 cm and a height of 15 cm.

Diagram **NOT**
accurately drawn

15 cm

4 cm

   Calculate the volume of the cylinder.
   Give your answer correct to 3 significant figures.

3. XYZ is a right-angled triangle. (3)

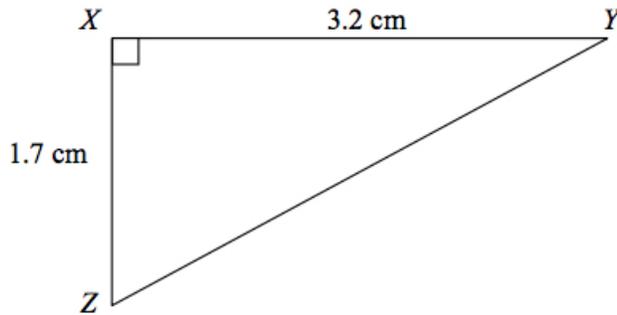X — 3.2 cm — Y

1.7 cm

Z

Diagram **NOT** accurately drawn

$XY = 3.2$ cm.
$XZ = 1.7$ cm.
Calculate the length of YZ.
Give your answer correct to 3 significant figures.

4. (a) Expand and simplify $\hspace{8cm}$ (2)
$$3(2x - 1) - 2(2x - 3).$$

(b) Factorise $\hspace{10cm}$ (1)
$$y^2 + y.$$

5. Charles found out the length of reign of each of 41 kings.
He used the information to complete the frequency table.

Length of reign (L years)	Number of kings
$0 < L \leqslant 10$	14
$10 < L \leqslant 20$	13
$20 < L \leqslant 30$	8
$30 < L \leqslant 40$	4
$40 < L \leqslant 50$	2

(a) Write down the class interval that contains the median. (2)

(b) Calculate an estimate for the mean length of reign. (4)

6. A floppy disk can store 1 440 000 bytes of data.

(a) Write the number 1 440 000 in standard form. (1)
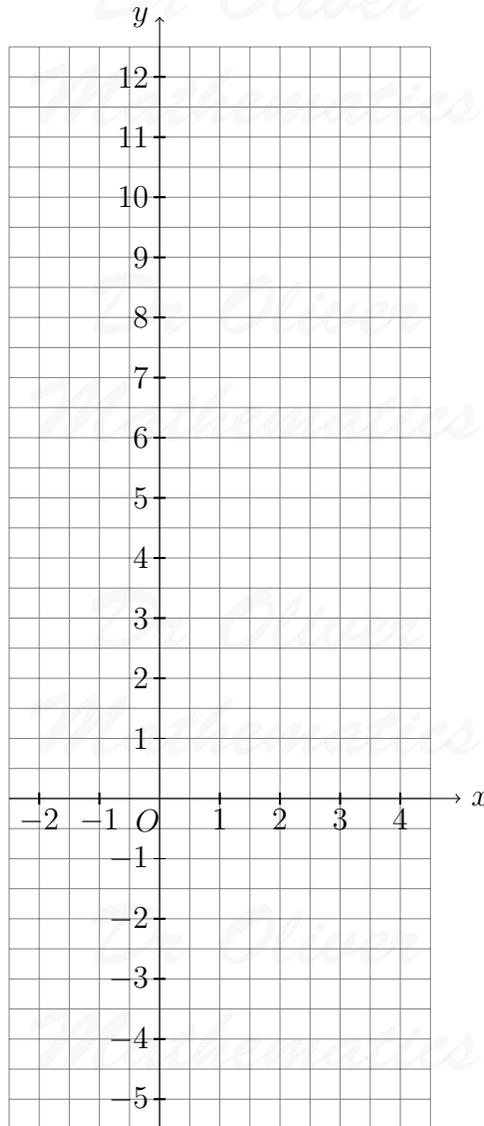
A hard disk can store 2.4×10^9 bytes of data.

(b) Calculate the number of floppy disks needed to store the 2.4×10^9 bytes of data. (3)

7. (a) Complete the table for $y = x^2 - 3x + 1$. (2)

x	-2	-1	0	1	2	3	4
y	11		1	-1		1	5

(b) On the grid, draw the graph of $y = x^2 - 3x + 1$. (2)

(c) Use your graph to find an estimate for the minimum value of y. (1)

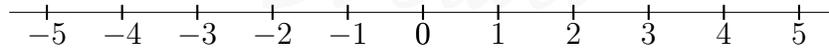(d) Use a graphical method to find estimates of the solutions to the equation (3)

$$x^2 - 3x + 1 = 2x - 4.$$

3

8. (a) (i) Solve the inequality (3)
$$5x - 7 < 2x - 1.$$

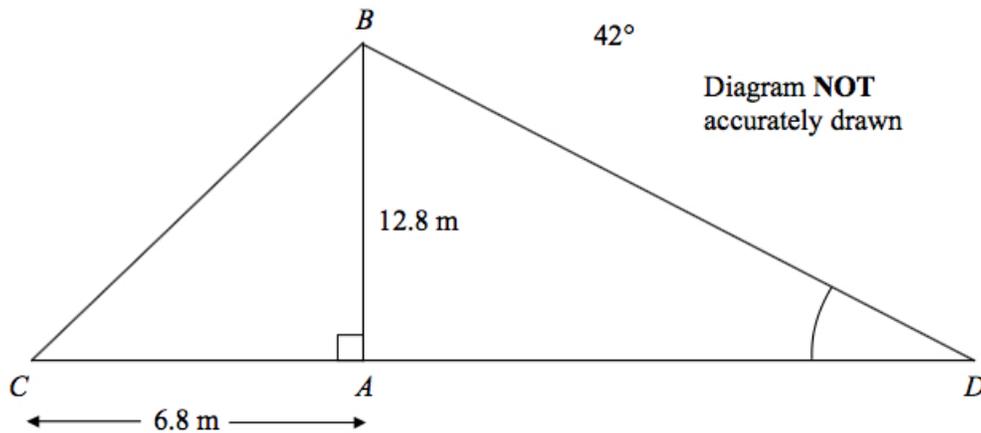(ii) On the number line, represent the solution set to part (i).

n is an integer such that $-4 \leqslant 2n < 3$.

(b) Write down the possible values of n. (3)

9. The diagram represents a vertical flagpole, AB.
The flagpole is supported by two ropes, BC and BD, fixed to the horizontal ground at C and D.

$AB = 12.8$ m.
$AC = 6.8$ m.
Angle $BDA = 42°$.

(a) Calculate the size of angle BCA. (3)
Give your answer correct to 3 significant figures.
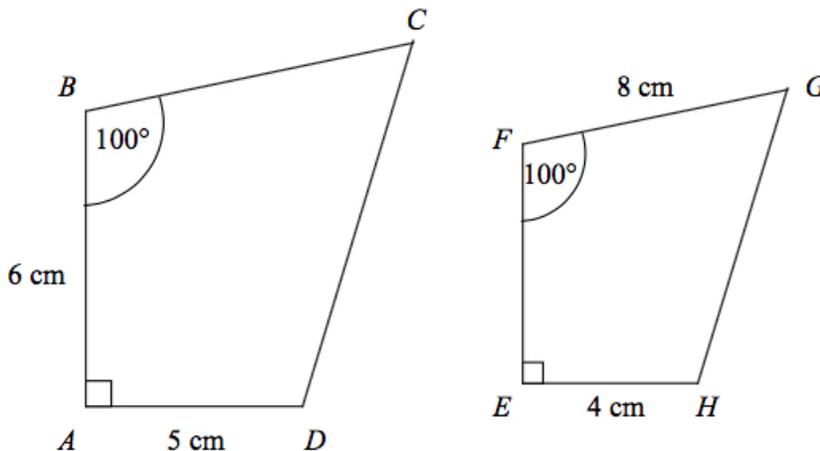
(b) Calculate the length of the rope BD. (3)
Give your answer correct to 3 significant figures.

10. Shapes $ABCD$ and $EFGH$ are mathematically similar. (5)

4

(i) Calculate the length of BC.

(ii) Calculate the length of EF.

11. Solve the simultaneous equations (4)

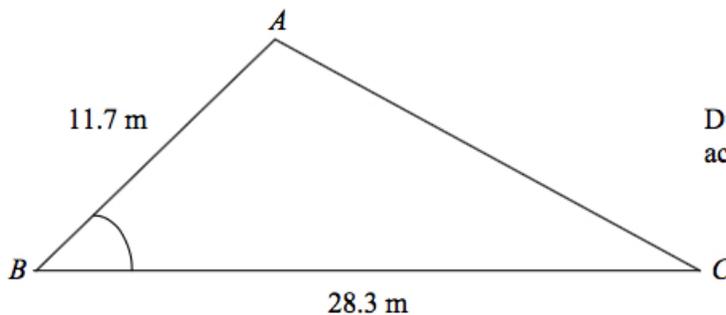$$2x + 3y = -3$$
$$3x - 2y = 28.$$

12. Here is a triangle ABC.

Diagram **NOT** accurately drawn

$AB = 11.7$ m.
$BC = 28.3$ m.
Angle $ABC = 67°$.

(a) Calculate the area of the triangle ABC. (2)
   Give your answer correct to 3 significant figures.

(b) Calculate the length of AC. (3)
　　Give your answer correct to 3 significant figures.

13. One Monday, Victoria measured the time, in seconds, that individual birds spent on her bird table.
　　She used this information to complete the frequency table.

Time (t seconds)	Frequency
$0 < t \leqslant 10$	8
$10 < t \leqslant 20$	16
$20 < t \leqslant 25$	15
$25 < t \leqslant 30$	12
$30 < t \leqslant 50$	6

(a) Use the table to complete the histogram. (3)

Time (t seconds)

6
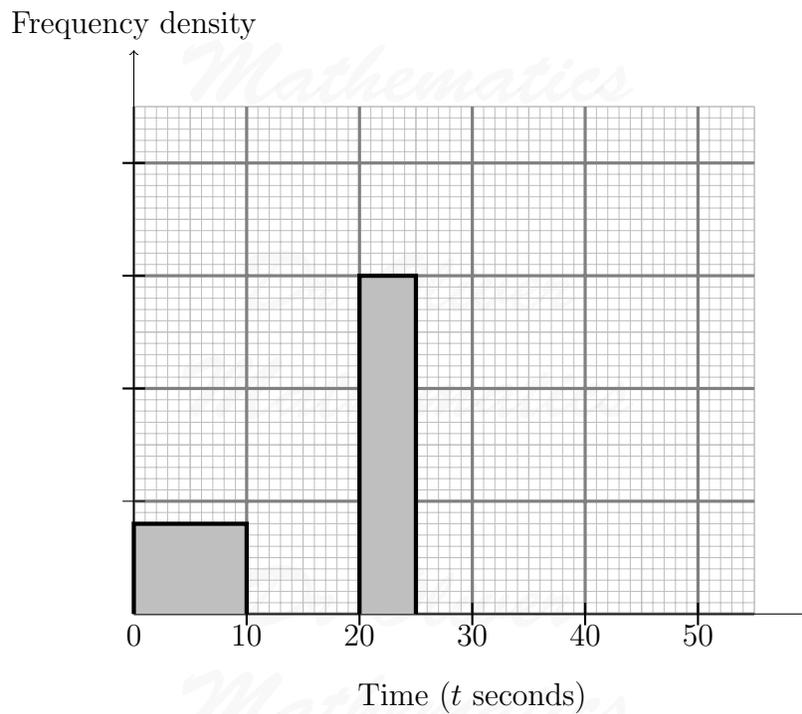
On Tuesday she conducted a similar survey and drew the following histogram from her results.

Frequency density
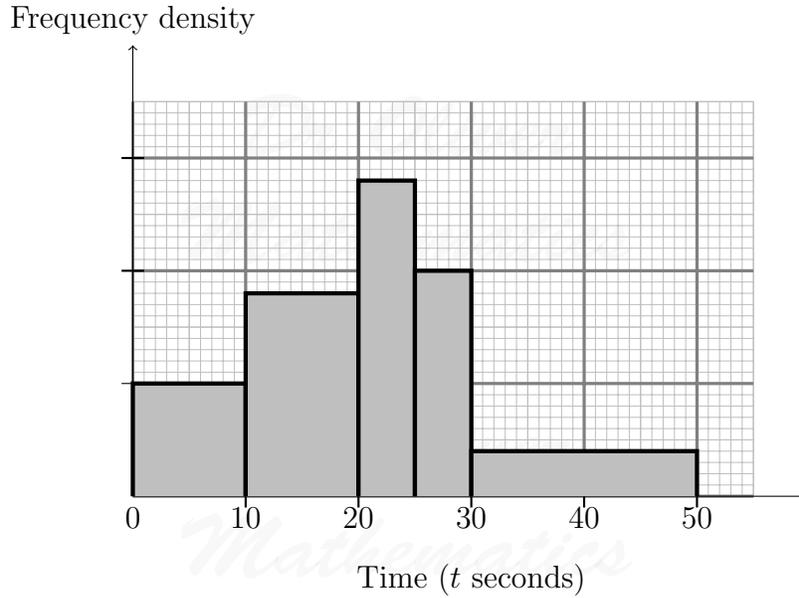
Time (t seconds)

(b) Use the histogram for Tuesday to complete the table. (2)

Time (t seconds)	Frequency
$0 < t \leqslant 10$	10
$10 < t \leqslant 20$	
$20 < t \leqslant 25$	
$25 < t \leqslant 30$	
$30 < t \leqslant 50$	

14. Prove that, (3)
$$(n + 1)^2 - (n - 1)^2$$
is a multiple of 4, for all positive integer values of n.

15. Two numbers have a difference of 15 and a product of 199.75.
The larger of the two numbers is x.

   (a) Show that (3)
$$x^2 - 15x - 199.75 = 0.$$

(b) Solve the equation (3)
$$x^2 - 15x - 199.75 = 0.$$

16. The diagram represents two metal spheres of different sizes.
    The radius of the smaller sphere is r cm.
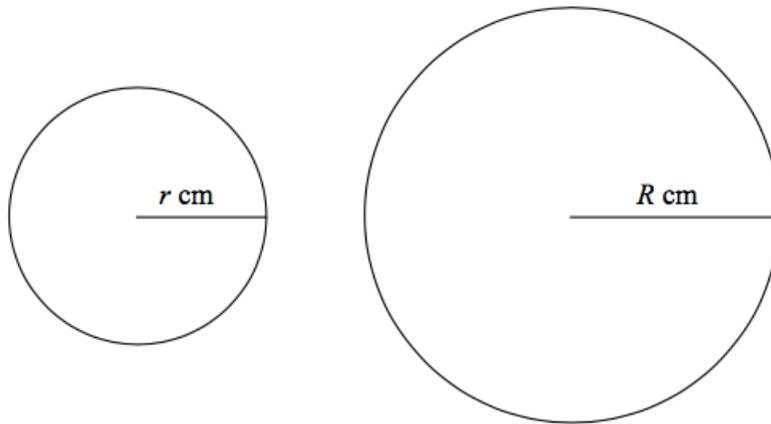   The radius of the larger sphere is R cm.

Diagram **NOT**
accurately drawn

r cm R cm

$r = 1.7$ correct to 1 decimal place.
$R = 31.0$ correct to 3 significant figures.

(a) Write down the upper and lower bounds of r and R. (2)

(b) Find the smallest possible value of $R - r$. (1)

The larger sphere of radius R cm was melted down and used to make smaller spheres of radius r cm.

(c) Calculate the smallest possible number of spheres that could be made. (4)
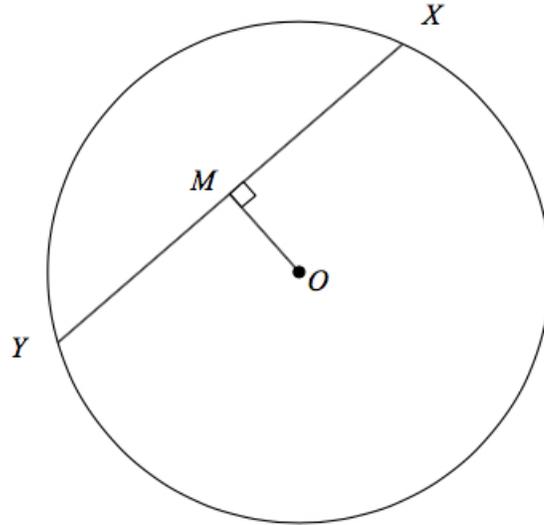
17. (a) Factorise (2)
$$9x^2 - 6x + 1.$$

(b) Simplify (3)
$$\frac{6x^2 + 7x - 3}{9x^2 - 6x + 1}.$$

18. X and Y are points on the circle, centre O. (3)

8

M is the point where the perpendicular from O meets the chord XY.
Prove that M is the midpoint of the chord XY.

19. Joan has two boxes of chocolates. (4)
    The boxes are labelled **A** and **B**.
    Box **A** contains 15 chocolates. There are 6 plain, 4 milk, and 5 white chocolates.
    Box **B** contains 12 chocolates. There are 4 plain, 3 milk, and 5 white chocolates.
    Joan takes one chocolate at random from each box.
    Work out the probability that the two chocolates Joan takes are not of the same type.

20. Solve the simultaneous equations (7)

$$x^2 + y^2 = 29$$
$$y - x = 3.$$

21. The depth, D metres, of the water at the end of a jetty in the afternoon can be modelled (4)
    by this formula
$$D = 5.5 + A\sin 30(t - k)^\circ$$

    where t hours is the number of hours after midday and A and k are constants.
    Yesterday the low tide was at 3 p.m.
    The depth of water at low tide was 3.5 m.
    Find the value of A and k.